Training recurrent Random Neural Networks: first and second-order techniques, reservoir models, numerical aspects

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Presentation in the Conference on Modelling Methods in Computer Systems, Networks and Bioinformatics, Paris, October 15, 2019.

Abstract

PSQA is a technology developed by the author during a period of several years, whose aim is quantifying the Quality of Experience (more precisely, the Perceived Quality) of an application or service built on the Internet around the transport of audio or video-audio signals. The main properties of PSQA are the its accuracy (indistinguishable from a subjective testing session), the fact that it is fully automatic, with no reference, and able to operate in real time. PSQA is based on supervised learning (the tool learns from subjective testing panels); once trained and validated, it works with no human intervention.

In the PSQA project we selected the Random Neural Network tool for the supervised learning associated tasks, after a comparison with the available techniques at the beginning of the project. In the presentation we will recall all these elements, including the numerical aspects on the optimization side of the learning process, and then, we will focus in the current developments where the goal is to predict the Perceived Quality in the close future. This includes the description of the Reservoir Computing models for time series forecasting, and of a tool we invented called Echo State Queueing Network, which is a mix between Reservoir Computing and Random Neural Networks.